

From these figures it appears the tree increased in growth only during the three months between middle of May and middle of August, and that the ratio of growth is much greater during the month between middle of June and middle of July than during the month preceding and the succeeding month.

Third Contribution to the History of the *BALENIDÆ* and *DELPHINIDÆ*.

BY EDWARD D. COPE.

DELPHINIDÆ.

ORCA DESTRUCTOR mihi sp. nov.

Among the species of this carnivorous genus of Cetaceans, the present exhibits the most compact and powerful structure, and it, no doubt, is fully equal to any of them in its sanguinary habits. The breadth of the premaxillary bones allies it to the species *crassidens* and *meridionalis*, which have been called *Pseudorca* by some.

It differs from the latter species in the greater breadth and obtuseness of the muzzle of its cranium and mandible—all we possess of it—and in the smaller number of teeth; the premaxillary bones are relatively narrower throughout the greater part of their length.

The width of the muzzle at the lateral maxillary notch is a trifle less than three-fourths the length from that point to the end of the muzzle; the width at the fifth tooth is a little greater, and quite three-fourths that distance. The premaxillary triangle is smooth, concave on each side the medium fissure, and extends to opposite the penultimate tooth. Teeth s_5 , the posterior tooth being the last of the maxillaries, instead of the mandibulars, as in *meridionalis*. The teeth occupy closely the intervals of the opposing series; those of the mandible are directed well outwards anteriorly. The intermaxillaries form an elevated ridge exteriorly opposite the notch; opposite the fifth tooth above each is less than double the width of maxillary exposed exterior to it. Behind the last tooth the margin of the maxillary is flared upwards in a steep arch; from opposite malar process to posterior tooth equals from posterior margin of latter to same of antepenultimate tooth. The mandibles are much depressed distally, and the symphysis equals one-third the length of the muzzle from the notch; the chin projects beyond the broad extremity of the premaxillaries. Measurements:—

	in.	lin.
End of muzzle to glenoid cavity.....	20	7
“ “ maxillary notch.....	11	6
“ “ last tooth (straight).....	9	6
Length of symphysis.....	4	
“ ramus mandibuli to condyle.....	20	3
Breadth of muzzle at notch.....	8	4.5
“ “ fifth tooth.....	8	6
“ “ anterior tooth.....	4	
Depth of ramus at last tooth.....	3	1
“ “ coronoid process.....	6	2

One specimen (No. 3679) is in the Museum Smithsonian Institution, Washington, from the Southern Pacific ocean, off Paita, Peru.

BELUGA ANGUSTATA m. sp. nov. *Beluga catodon* m. Proc. Academy, 1865, 278.

A study of the skeleton of the *Beluga catodon* (or *leucas*), deposited by the Smithsonian Institution in the Museum of Columbia College, Washington, convinces me that the species which I formerly regarded as the same is really quite different. For the present the following comparison will suffice:—

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<i>B. angustata.</i>		<i>B. catodon</i> Fabr.
Tripodal	<i>Prenarial maxillary area;</i>	Triangular
Ten	<i>Dorsal vertebrae and ribs;</i>	Eleven
No vertebral canal	<i>Cervical vertebrae;</i>	One or two with vertebral canals, spine of axis ele- vated, tectiform.
Spine of axis flat ;		Coracoid long, slender, in plane of plate.
Coracoid deflected from plane, short ;	<i>Scapula</i>	Elongate, superior mar- gin with a long concav- ity.
Shorter, superior outline regularly arched.		

In the specimen of the *B. catodon*, the o. o. palatinae are slightly in contact ; in the *B. angustata* the contact is extensive and quite as in *B. concreta*.

The *B. canadensis* resembles the *B. catodon*, except in the form of the scapula, and of the prenares maxillary area, in which respect it does not differ from the *B. angustata*. Examination of a specimen received by the Academy from Prof. Brunet, of the Laval University, Quebec, shows the postero-inferior process of the atlas to be present, Dr. Wyman's figure, previously cited by me, being erroneous in this respect.*

PHOCÆNA BRACHYCIUM, Cope, Proc. A. N. Sci., Phila., 1865, 279.

The specimen supposed by me to be the *Ph. communis*, with which the present species was compared, belongs to the *Ph. vomerina** Gill, of the Californian waters. Having since received from the Smithsonian Institution two crania of the *Ph. communis*, from the North Atlantic, comparison shows a greater resemblance to the *Ph. brachycium*. The differences are, the maxillaries in *communis* are decurved, as in *vomerina*, and more than in *brachycium* ; in *communis* the vomer appears more posteriorly on the palate, being less than its own length in advance of the line of the posterior teeth ; in *brachycium* this distance is nearly double the length of the visible portion. The projecting portion of the pterygoids is equal to the portion in advance of the posterior margin of the maxillaries, while in the *P. brachycium* it is much less. The muzzle in advance of the posterior extremity of the vomer is barely contained $2\frac{1}{2}$ times in the length to the extremity of the pterygoids, while it is one third that distance in the *communis*. In other respects the crania, including the teeth, are nearly similar ; and it must be admitted that the full establishment of our species must depend on further investigations.

SAGMATIAS AMBLODON, sp. et. gen. nov.

Char. Gener. Supraorbital expansions of the o. o. maxillares obliquely descending and diminishing to a thin edge. No triangular prenares depression ; gonys short ; teeth very short, obtuse, numerous.

It will be a matter of importance in the completion of the characters of this genus, to ascertain the presence of a dorsal fin. Supposing it to possess one, it remains intermediate between *Delphinus* sect. *Lagenorhynchus*, Gray, and *Phocæna*, differing only from the latter in the cylindrical form of the teeth. Like the *Phocæna*, the only species has the posterior extremities of the intermaxillaries much elevated and smaller. Supposing it to lack the dorsal fin, it will differ from *Neomeris* in the form of the teeth, from *Beluga* in the number of the teeth, and from *Delphinapterus* in the horizontal orbital plates and prenares triangle of the latter.

Char. sp. cif. Triangle replaced by a rugose area, which measures two-fifths the length of the muzzle from the notch. Muzzle entirely flat, premaxillaries in contact from nares to within two inches of end. On anterior half maxillaries not decurved to alveolar margin, but oblique ; exposed portion at

* Proc. Acad., Phila., 1865, 178.

basal one-fourth, one third breadth of combined premaxillaries, not recurved on the margin. Antero-exterior ridge of nasals prominent, enclosing two pits behind margin of vomer; median portion of frontals separating nasals well from supraoccipital, and the same from each other by an anterior process; with an anterior process of supraoccipital forming a prominent knob. Supraoccipital crest remarkably strong and directed nearly horizontally forwards. Pterygoids in contact on the median line, posterior margins widely divergent; inferior angles separated, much rounded, median depression considerable. Common suture of palatines considerable, nearly equal gonys. Maxillaries closely in contact on the palate, not exhibiting vomer or premaxillaries, except a little of the latter on the distal inch. Coronoid process of mandible everted; ramus on distal half thickened internally, so that the dental series converge far less on the posterior half its length than on the anterior. Occiput transverse, little convexity between the posterior ridges of the temporal fossæ. Latter large, subrhomboid in outline. No portion of maxillaries visible between preareal swellings; these elevations descend gradually anteriorly and are steep laterally, not grooved. Longest (right) prolongation of premaxillary not attaining nasal bone.

The remaining and more prominent features of this species are apparent from the following measurements:—

Length from end muzzle to convexity of occipital condyle.....	15.25
“ “ “ notch.....	7.6
Depth of cranial chamber.....	4.9
Length of ramus mandibuli.....	11.75
“ gonys	1.25
Width at temporal fossæ.....	7
“ orbits.....	6.5
“ notch.....	3.79
“ middle of muzzle.	2.5
“ of preareal elevations.....	2.79

The shelving form of the supraorbital plates of this species suggests a relationship to the *Delphinus (Tursio) aurostoma*, Gray, but it is evident that the *S. amblyodon* differs entirely from any species of *Delphinus* hitherto known.

The habitat of this species is uncertain. It was taken off the ship *Vincennes*, of the U. S. Exploring Expedition. On inquiry of Dr. Charles Pickering, naturalist on board of that vessel, he has no record or recollection of the capture of such a species; it was therefore probably procured while he was absent from the ship from Cape Horn to Lima, or afterwards during his stay on land in Australia and New Zealand.

DELPHINUS LONGIDENS.

Of the type of *D. (Tursio) obscurus* Gray, but with considerably longer muzzle and much longer preareal triangle, the rugose surface of which extends to the end of the basal third of the length of the muzzle. Muzzle from notch just twice the length of cranial chamber, shorter than mandible, flat above on the basal two-thirds, the premaxillaries continuous with maxillaries, not bounding the triangle in front by a ridge. Sides of muzzle quite steep near tip. Preareal portion of triangle full plane. Premaxillaries not visible on palatine surface till near tip; pterygoids not in contact, prominent ridge. Teeth slender, acute, spreading, four and an interspace in an inch, $\frac{3}{7}$, anteriorly not separated by alveolar partitions; occiput flat, rounded in profile; nasal bones subtransverse, very near the moderate supraoccipital crest.

Length of cranial chamber.....	4	in.
“ cranium, total.....	15.25	
“ muzzle to notch.....	8.25	
“ mandible.....	12.25	

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Length of symphysis mandibuli.....	1.25
“ temporal fossa.....	2.50
Breadth between orbits.....	6.30
“ at notch.....	3.55
“ at middle of muzzle.....	3.38
“ of intermaxillary at middle.....	1.375

From the above it will be seen that the nearest ally of this species is the *Delphinus* (*Lagenorhynchus*) *clanculus* Gray, in which the muzzle is considerably shorter and the cranium relatively longer and wider; that is, length of cranium proper equal in the latter to the length of the muzzle, and breadth at orbits a little greater than either. Its form renders a distinction between *Lagenorhynchus* and *Delphinus* improbable, on present bases.

Habitat unknown. Museum Smithsonian, No. 3886.

DELPHINUS PLAGIODON, sp. nov.

A robust species of the subgroup *Tursio*, (Gray), with a strongly depressed triangle extending but little in advance of the posterior tooth. It is in many points allied to the *D. doris*, but differs in the muzzle being compressed rather than depressed, especially at the tip, the teeth fitting very closely and compressed transversely to the jaw, scarce four in an inch; and from the specimen of the Museum Salem, in having the mandible heavy and much prolonged at the symphysis. The form is an approximation to *Steno*, but the symphysis is short, nevertheless not more so than in *St. tucuxi* Gray. Until other characters are adduced it will not be possible to distinguish *Steno*, *Tursio*, *Delphinus* and *Lagenorhynchus* as more than one genus. In this view I support the already expressed opinion of Lilljeborg.

Maxillaries much decurved, their elevation above the alveoli scarcely greater than that of the premaxillaries above themselves. The latter form a very strong rounded ridge, straight as far as visible in profile. Width at notch two and two-third times in length. Prenarial part of triangle moderately concave medially, with the terminal portion rugose. Supraorbital plates of maxillary externally thickened; in front of notch distinctly recurved. Pterygoids in contact, exteriorly plane, inferior angle sharp, included depression angulate. Vomer well displayed at middle of palatal face, not in contact with maxillaries; premaxillaries narrowly visible on the anterior half. Teeth $3\frac{4}{32}$, stout, occiput flat transversely, prolonged, rounded in profile, and not acuminate, incurved. Supraoccipital crest rather weak. Measurements:—

Length to outline of occipital condyles.....	17
“ maxillary notch.....	9.80
“ of temporal fossa.....	3.1
“ upper tooth line.....	8.25
“ ramus mandibuli.....	14.4
“ symphysis mandibuli.....	2
Depth of cranial chamber.....	4.75
Width at temporal crests behind.....	5.6
“ above orbits.....	7.25
“ at notch.....	3.55
“ at middle of muzzle.....	2.375

Habitat is unknown. No. 3884 Mus. Smithsonian.

This species resembles closely the figure of the *D. doris* given by Dr. Gray in Zool. of Erebus and Terror, but does not at all agree with his description published in the Catalogue Cetaceans Brit. Mus., 1865, which applies closely to the specimen described by me, Proc. Academy, 1865. As the crania which have fallen under my observation are those of undoubtedly distinct species, I have been at a loss which to regard as the true *D. doris*. I think it would probably be more acceptable to the describer of the latter to regard

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the description written by himself as the more infallible test, than the figure drawn by another, and therefore more liable to error. A figure of that which coincides exactly with Dr. Gray's description will shortly be published.

It may be mentioned that the teeth of *Delphinus erebennus*, stated by me to be truncate like those of the *D. tursio*, on the authority of Dr. S. J. Howell, are found on examination to have an exceedingly oblique truncation behind, extending from the alveolar line to the apex.

PONTOPORIA CALVERTENSIS (*Delphinus calvertensis*) Harlan, Proc. National Institution 1842, 195.

This extinct species differs specifically from the recent *P. blainvilliei* of the Southern Atlantic Ocean.

BALÆNIDÆ.

SIBBALDIUS LATICEPS Gray.

Catalogue Cetaceans, Mus. Britt. 170. *Balæna rostrata* Rudolphi, Berlin Abhandl. 1820.

An examination of the skeleton of the cetacean described by Prof. Taliaferro, Proc. Acad. 1866, page 8, and now deposited in the museum of the Academy by Dr. P. A. Taliaferro, has shown it to be the above named species, which is therefore to be added to the United States Fauna.

Length from end of muzzle over convexity of back, forty-six feet nine inches; girth about nineteen feet; length from end of muzzle to axilla, (external measurement,) fifteen feet; breadth of head across inferior margin of jaws, eight feet. Length of the pectoral extremity *four feet*, greatest breadth fifteen inches; they were situated close behind the angle of the mouth. There were 360 laminae of black baleen, extending on either side of the mouth about six feet along the jaw, the longest about eighteen to twenty inches. The head was acute. The folds of the throat many and capacious. The dorsal fin was represented by a conical mass covered by horny integument, without any membranous appendage, situated well posteriorly. The body near the tail very slender. The flukes suddenly expand to a breadth of ten feet. The vertebral line from the dorsal fin to the flukes, with six or eight knobs or humps. Color, jet black above, including flippers, below white, sides beautifully marbled by a combination of the two colors.

	ft.	in.
Total length of cranium.....	10	3
Length supraoccipital to inferior margin of foramen magnum	2	7
" o. maxillare from orbital process frontal.....	6	3
Width do. at 3 ft. 1½ in.....		7·5
Breadth cranium from posterior angle to angle of orbital processes of frontal.....	4	8
From latter to plane posterior angle supraoccipital.....	2	2
Width supraoccipitals behind.....	3	3
" nasal meatus anterior to o. o. nasalia.....		9·25

The supraoccipital overarches on each side, a lateral longitudinal concavity, which passes under or downwards, behind the horizontal frontal plates. Superior inner edge of frontals raised ten inches above these orbital plates. Pre-maxillaries only three inches in diameter, leaving a wide median gap on top of the muzzle.

The os hyoides has very little longitudinal extent, the body being 9 inches long, while the base of each ceratohyal is 5·5 inches across; body most prolonged posteriorly, where it is narrowed, truncate, and with a deep longitudinal fissure.

The scapula is, as described for the species, like that of a Beluga, of considerable longitudinal extent, and furnished with long coracoid and acromion.

Of the anterior extremity, the humerus is less than half the length of the radius, thirteen inches long, with the articular surfaces for ulna and radius nearly equal.

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The atlas possesses an acuminate median diapophysis, curved back, and with arterial perforation on one side. Spinal canal narrowed below, vertical depth 5.5 inches; breadth above 3.5, below at middle, 2. A strong inferior posterior process as in Beluga. Articular surfaces continuous.

The second, third and fourth cervicals with large completely united superior and inferior lateral processes. Neural canal broad, depressed; centrum transverse quadrate. Seventh cervical without inferior lateral process; the superior compressed slightly descending, equal depth centrum, 6 inches. Articular surfaces of ribs on third to sixth dorsals, crescentic. Dorsal vertebrae preserved, eleven: probably one or more have been temporarily removed. Neural spines elevated, especially on lumbar region, where the zygapophyses stand at only one-fifth the height of the arch and spine.

First rib, measurements:

	ft.	in.
Length, with curve of middle.....	2	11.5
Width at small tuberosity.....		4.75
" end.....		7.5
" middle.....		5.5

One of the longer ribs, with a slight ala on one edge, six feet long.

There are some peculiarities of the present individual which render its identification with the *Sibbaldius laticeps* not yet entirely established. Rudolphi observes that the acromion is very rudimental in his type, while in ours it is like the coracoid, well developed. Lilljeborg and Gray, l. c., state the dorsal fin to be compressed and falcate, while in the Mobjack specimen it is rudimental and conic. The hyoid bone is precisely as figured by Rudolphi. The dorsal fin resembles that of the *S. borealis* Fisch. (*gigas* Van Beu.), but the species differs markedly in the following points:

Dubar says the posterior dorsal median line is keeled; according to Dr. Taliaferro this one has several humps. Dubar's figure of the first rib differs very much from ours: former, end emarginate, its breadth $2\frac{2}{3}$ the length; the latter, end entire, breadth $4\frac{1}{2}$ the length. Our specimen is entirely adult at a length of 43 feet (axial); Dubar's specimen had attained 102 feet. This difference is important, as growth ceases with the coalescence of the epiphyses, as in other mammals. Lastly, Dubar's type possessed an inferior lateral process on the seventh cervical, wanting in ours.

The following extract from the Richmond Enquirer of Eighth month 23d, 1858, furnished me by Prof. Taliaferro, gives a lively account of the capture of this specimen:

"On Wednesday, the 4th inst., an unusual excitement was manifested among the fishermen at the mouth of North and Ware Rivers, on Mobjack Bay, and in a few moments scores of canoes might have been seen pulling up stakes and anchors, and making for the shore in every direction. It was soon reported that an immense fish, supposed to be a whale, of incredible dimensions, was cutting all sorts of capers in the Bay: blowing like ever so many bulls, spouting water, and amusing himself by making a great rumpus, to the great terror and peril of some of the citizens of the commonwealth, who 'go down to the sea' in small canoes. But after the lapse of a few hours nothing more was seen or heard of the monster, and the report of his visit scarcely excited attention, even if it commanded credence.

"On the Monday morning following, however, an extraordinary noise on the river (North) near Belle Ville, the residence of Warner T. Taliaferro, Esq., attracted the attention of the family about daybreak, and on hastening to the shore, they beheld the creature aground on a bar near the landing.

"The gentlemen, determined to attempt his capture, instantly leaped into a boat, and sent off for gigs, (small harpoons used by our fishermen for striking the bonito,) pulled around him to reconnoitre whilst the weapons were being procured.

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"Whilst they were laying off, however, quietly reconnoitering the salient and weak points of attack, measuring with their eyes the length and breadth of their immense adversary, and impatiently awaiting the collection and arrival of the materials of war, the tide, which unfortunately was flooding, lifted him, just before the preparations for the attack could be completed, from his perilous bed in the sand; and with a prodigious effort he threw himself off the bar, bounded into the channel, and in an instant was out of sight.

"Nothing more was seen of him, and it was feared he had made his way out of the capes, and to the bergs and ice floes of more congenial latitudes, after his uncomfortable experiences of shallow water. But on Wednesday evening, the 11th inst., he was again descried making his way, like a small propeller, straight up North River, rising every ten or fifteen minutes, throwing graceful *jets d'eau* into the air more than thirty feet high, and sporting on the surface of the water. When off Burgh Westra, the residence of Dr. P. A. Taliaferro, that gentleman, with his brother, Edwin Taliaferro, Esq., accompanied by Mrs. ———, who, carried away by the excitement, insisted (under threat of having her own boat manned) upon joining the expedition, and witnessing the sport, as well as sharing the peril. Having hastily collected all the fire-arms at hand, consisting of shot guns and five-shooters, and having fastened a sword to a staff for a lance, they pushed off with a trusty crew of negro oarsmen, in a launch of twenty feet in length, and rowed boldly for the huge monster. He arose usually to breathe and spout water about every ten or fifteen minutes, and then descended, reappearing at the expiration of that time between a quarter and half a mile distant from the place of descent.

"Closely calculating the distance at which he would rise, and pulling in the direction in which he disappeared, they succeeded in measuring so accurately the time and space, that the third time he came to the surface after they started, they found themselves within a few feet of him, as he lay with his whole length exposed upon the water.

"To pour a heavy charge of buckshot into his flank was with Dr. T. the work of an instant, when off the creature darted like lightning, pursued with a hearty cheer by the boat's crew.

"Again and again he rose, and again and again was the gallant boat with her undaunted crew close beside him, pulling for their lives to head him, and cut off his retreat from the river to the bay. For some moments, at one time, he was seen swimming under the water, with his immense mouth, wide enough to have taken in and crushed the frail boat, extended, and making directly for her; but a few quick and lusty back strokes of the oars put her beyond peril,—and as he arose within ten feet of her quarter, a second discharge of ball and buck drove him frantic upon a bar, and the blood-tinged column of water which he spouted into the air told the story of a mortal wound.

"Pulling the boat within a few feet of his body, far enough off to escape a blow from his tail, Dr. T. courageously leaped overboard into five feet water, and boldly attacked him with an impromptu lance, made of an old Toledo blade which had done service in several wars. Though mortally wounded, however, and attacked sword in hand, the whale would not yield himself vanquished and a prisoner without another struggle, and, to the dismay of the assailants and the crowds which had by this time collected on the beach, by a convulsive and violent effort he floundered into deep water, and made a straight run for the bay. But he was now too much exhausted to escape, and the boat pulling fearlessly upon him, headed him within a few hundred yards, and drove him again upon the shore, upon the estate, and near the residence of Gen. Taliaferro, where cables and ropes were fastened to his tail, and he was dragged to the shore by a force of over one hundred and fifty ne roes, who had assembled to witness the sport, and despatched, after a most exciting contest, from first to last, of over three hours.

"On dissection, the stomach was found to contain nothing but crabs."

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The only other whale recorded as taken in the Chesapeake is mentioned in the above article as having been captured near New Point Comfort, Matthews County, north of Moljack Bay, a few years previously.

On the REPTILIA and BATRACHIA of the ³⁰Sonoran Province of the Nearctic Region.

BY EDW. D. COPE.

The material on which the present essay is based, is a collection made by Dr. Elliott Coues during a sojourn of sixteen months in and "travels over the Territory of Arizona from east to west, chiefly near the parallel of 35°, and along the valley of the Colorado from Fort Mojave to Fort Yuma." Notes of observations made by Dr. Coues on the different species materially add to their interest.

BATRACHIA.

URODELA.

Amblystoma? nebulosum Hallowell, Journ. Acad. Nat. Sci. (?) v. 252, iii.

In the Siredon stage differing from the *S. gracilis* Baird in its oblique branchial arches with finer pectinations, and in coloration. On the anterior side of the third arch, twenty pectinations or rakers may be counted; in the *S. pisciformis* (or *mexicanus*) there are but twelve. Color in life "shining green above, silvery greenish-white below, more yellowish about legs and gills; a few obsolete scattered black spots on head and back. Eyes and branchial fimbriae black," (Coues' notes). 455—56 ♀ from Jacob's well; No. 491 ♂ from a deep water tank in the rocks of the San Francisco mountains.

Male about seven inches long; branchiæ well developed; gular derm free half-way to symphysis mandibuli. Twelve costal folds. Muzzle slightly narrowed jaws equal. Lateral and dorsal peritonæum black. The lungs extend to opposite the inguinal region. Corpus adiposum extending on testes to their anterior extremity. Testes undivided, broad, length equal half that from axilla to anus; efferent vessels numerous, not entering directly the vas uro-spermaticus. The latter is very slender, lying along the outer margin, but not in contact with, the narrow kidney; opposite the latter recurrently convolute, anterior to it straight, and extending to opposite axilla with decreasing diameter. It empties into the rectum near the cloaca. Cloaca protected on each side by a large vertical compressed gland, which is fringed on its inferior border, (which is received into the lip of the cloaca,) and also on its superior margin, which lies next the caudal vertebra. It is continuous in front of anus; behind the two edges are pressed together. Integument of cloaca thrown into numerous appressed vertical plicæ, as in other Siredons.

Stomach straight, extending to the left groin, filled with larvæ of Diptera Nematocera. Intestines long, rectum large.

Female smaller, many of the ova black. In these animals the tarsal and carpal bones are fully formed, but cartilaginous. The pterygoid and palatine teeth in continuous series, the latter slightly separated medially, and concentric with maxillary series. On this character, preserved in a stage of an allied species without branchia, I proposed the genus *Camarataxis*, the validity of which can only be established when the development of all our *Amblystomas* is known. It is a stage nearer the larval condition than the transverse series of *A. opacum*, while the \wedge -shaped series of *A. luridum* is intermediate.

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